-REMARKS/ARGUMENTS-

Claims 1 to 29 remain in the application.

Claims 1-11 stand rejected under 35 U.S.C. 102(b), as being anticipated by GB 493,635.

Independent claim 1 is directed to a joist characterized by the fact that the lower and upper flat end portions 34 and 36 (see Fig. 1) of each tension web 18 are respectively pressed against the lower chord 14 and the upper chord 16 by a corresponding lower flat end portion 46 of an adjacent compression web 16 and a corresponding upper flat end portion 44 of another adjacent compression web 16. The arrangement of webs (inclined and vertical) at the nodes is such that when two inclined (diagonal), or inclined and vertical webs are combined (Figure 3 and Figure 1 respectively), the one in tension is always in contact with the top and the bottom chords, therefore the member in compression prevents straightening-up of the web in tension.

The joist recited in claim 1 is further characterized by the fact that the compression webs 16 are connected at a first end thereof to an adjacent tension web 18 and at an opposed end thereof to another adjacent tension web 18. This arrangement is important to guarantee the transmission of compressive loads from one compression web to adjacent tension webs and so on.

It is respectfully submitted that GB 493,635 fails to teach or to suggest a joist wherein each compression web has lower and upper angularly extending flat end portions which are respectively independently bolted to a top surface of the lower chord and an angularly extending lower flat end portions of an adjacent one of the tension webs, and to an undersurface of the upper chord and an angularly extending upper flat end portion of another adjacent one of the tension webs, as recited in independent claim 1. In GB 493,635, the vertical stay 13 is **not** connected at its upper flat end to another adjacent one of the inclined stays 12. The upper end of the vertical stay 13 is solely connected to the upper chord 10. This

breaks the chain of load transmission in the stays 12 and 13. This arrangement has a completely different structural behavior than the arrangement claimed in independent Claim 1, wherein the compression webs 16 are connected at a first end thereof to an adjacent tension web 18 and at an opposed end thereof to another adjacent tension web 18.

The magnitude of the axial compressive force in the vertical stays 13 in GB 493,635 is governed by the flexible stiffness of the top chord 10 to which the stays 13 are attached at their upper ends, as well as to the portion of an eventual vertical load on the chord. In trusses having this arrangement of stays, the actual force in the vertical stays is very small if not zero. Therefore, the ability of the vertical stays 13 to press the incline stays 12 against the flange member 11 is almost non-existent. As a consequence, the inclined stays 12 in tension tend to straighten-up by detaching itself from the flange 11. The tests conducted in the scope of the development of the present invention demonstrate that the accumulation of many (at every node) of these additional and normally not accounted deformations at the joints increases the overall truss deflection up to 30%. In view of the foregoing, it cannot be said that the flat end portions of the inclined stays 12 in GB 493,635 are pressed against the chords by the vertical stays 13, as recited in independent claim 1.

In summary, the structure disclosed in GB 493,635 has an overall structural behavior that is quite different from that of the structure claimed in independent claim 1. This is because GB 493,635 fails to teach a joist comprising a series of tension and compression webs wherein each compression web presses one upper end of an adjacent tension web against an upper chord and a lower end of another adjacent tension web against a lower chord. In GB 493,635, each vertical stay 13 is connected at one end thereof solely to an associated chord and consequently, the ability of the vertical stay 13 to press the incline stays 12 is almost non-existent.

Regarding claim 2, it is respectfully submitted that in GB 493,635, the vertical stays 13 are **not** bolted at their upper flat ends to another adjacent one of the inclined stays 12.

Turning to claim 3, it is respectfully submitted that the invention in GB 493,635, because of the nodal eccentricity of the stays, could never have only one bolt per connection. This is clearly indicated in GB 493,635 and shown in sections 2-2 and 3-3 of Fig. 1.

Claim 5 is also believed clearly patentable over GB 493,635 as reciting that the intermediate section of each compression web extends between the proximal end of the flat end portion of the adjacent tension web and the corresponding connecting bolts, thereby preventing transmission of tensile forces to the bolts. In contrast, the bolts 20 in GB 493, 635 at the connection where three web members (inclined stays 12 and vertical stay 13) are joined with the lower chord 11 have to transfer a combination of shear and tension forces from one inclined stay 12 to the vertical stay 13, the chord member 11 and the other inclined stay 12. The bolts in Applicant's present invention only transfer shear forces and hence their load carrying capacity is doubled. Therefore, their number is reduced for approximately 50% and the time of automated fabrication of the joist is reduced as well. Applicant's arrangement of Z-shaped vertical web member having an intermediate portion extending between the proximal end of the flat end portions of adjacent tension webs considerably improves the structural behavior of the claimed joist in terms of overall deflection and also contributes to reduce the bolts requirements. The arrangement of the tension webs 18, the compression web 16 and the chords 12 and 14 of Applicant's present invention is such that their neutral axes are centered almost perfectly to intersect in a single point (theoretical node of the joist). This practically eliminates end member moments at the connection that in the case of thin-plate-cold-formed structural elements considerably contributes to the reduction of their buckling strength. Thc nodal eccentricity of the members of the structure disclosed in GB 493,635 is such that it is penalizing the elements strength. From Figure 1 of the GB 493,635, it is clear that the longitudinal axis of the vertical stay is located at distal end of the flat end portion of the adjacent inclined stays 12. This is contrary to claim 5.

Regarding claims 8-11, it is respectfully submitted that GB 493,635 does not teach adding an eccentric load transferring member at the connection between two inclined web members (Figs. 3-5) in order to 1) prevent local buckling of the horizontal flats of the chords near the bolt, 2) prevent flexure at the extremities of the inclined web members in tension thereby improving the strength of the tensile members without changing the shape or the thickness thereof, 3) reduce the flexibility of the connections hence reducing the overall deflection without increasing the strength of the members or height of the truss, and 4) modifying the natural frequency and dumping of the truss without increasing the member sizes or height of the truss. It is respectfully, submitted that the angle iron 21 and 22 are located outwardly of the chords 10 and 11 and are thus not in bearing contact with the webs.

Claims 17-20, 22, 23, 26 and 27 stand rejected under 35 U.S.C. 102(b) as being anticipated by GB 493,635. Claims 21, 24, 25, 28 and 29 stand rejected under 35 U.S.C. 103(a) as being obvious over GB 493,635.

According to the Examiner, role forming into shape, cutting to predetermined lengths etc. is inherently suggested by GB 493, 635 in order to manufacture the joists. Also since bolting is mentioned as method of securing the different parts with each other, it is implicit that holes have to be defined in the flattened ends of the webs and in the chords. GB 493,635 however, does not disclose the method of automated or continuous manufacturing of the joists. The problem to be solved with the present invention can therefore be regarded as finding a method, which makes a continuous production of joists possible. This is solved in the present invention in that chords are advanced in a substantially continuous manner to die punch station where holes are defined in said chords according to a predetermined pattern. Claims 17-29 of the present invention define a distinct procedure of an automated manufacturing of open web bolted steel joists. The process starts with a preparation of steel plates stored in rolls until their assembling. The sequences of the automated process as shown in Fig. 8 of the present invention provide an optimized

economical procedure that is non-existent in the British patent GB 493,635.

Claim 12 stands rejected under 35 U.S.C. 103(a) as being obvious over GB 493,635 in view of United States Patent No. 5,003,748 (Carr).

The connection accommodating two diagonal members (item 12 patent GB 493-635 as well as US Patent No. 5,003,748) and the top or bottom chord Fig. 1, does not have a washer or the like able to prevent the local bending in the diagonals from the eccentricity created due to the shifting of the centroid in the diagonal after it has been flattened at the ends. This is particularly the case for the diagonal members having non-symmetrical cross-sections (such as majority of diagonals used in practice and as the ones proposed in our invention Fig. 5).

These eccentric washers are not used only for the purpose of transferring loads. Their shape and eccentricity has entirely different role. The combination of an eccentric washer with a pair of opposed diagonally extending tension and compression webs at a node of a bolted metal joist provides unexpected results:

prevents local buckling (bulging) of the horizontal flats of the chords near the bolt;

prevents flexure at the extremities (close to the connections) of the inclined web members (diagonals) in tension, (avoiding axial force -local bending moment combination), therefore the strength of the tensile members improves without change of the shape or the thickness (that is the weight of the truss does not change);

reduces the flexibility of the connections, hence reducing the overall deflection without increasing the strength of the members or height of the truss (that is weight of the truss);

modifies the natural frequency and dumping of the truss, hence without increasing the member sizes or height of the trusses helps to avoid the resonance with the frequencies of the dynamic loads on the floors (machinery in operation, dancing, waking etc.).

It is customary practice in today's steel industry to reduce the floor flexibility by increasing the depth of the joists or increasing the strength of their members by selecting heavier sections. Also, it is customary practice to modify the natural frequency of the floor structure by increasing the depth of the joists or to increase the floor mass by adding dead load. The idea of introducing the non-symmetrically extended washer will change this customary practice in a very economical way. The invention is therefore not obvious even for a person skilled in the art. The elements influencing the appropriate use of the washer are: (a) the friction at the contact between the washer and the "inclined stay" -the torque applied to the bolt, (b) the rigidity of the washer, (c) the extended portion of the washer over the "inclined stay". It took considerable research and time prior to the assessment of the advantages of this element of the invention.

Therefore, the introduction of the non-symmetrically extended washer of the presented shape is definitely not an "old and very well known in the art for there use in transferring loads ". They are not known so far within the customary practice followed by a person skilled in the art. It is a major improvement in the structural behavior of steel joists composed of tin-plate cold formed elements having single bolt connections.

Claim 13 stands rejected under 35 U.S.C. 103(a) as being obvious over United States Patent No. 4,621,475 (McClain).

It is respectfully submitted that the features of dependent claims 10-12 are not directly known from the prior art, they do not concern only minor modifications because:

According to McClain, the webs are individually welded to the chords. Therefore, the tension and compression webs do not overlap at the connections and, thus, they are not attached with a common bolt to the chords. This is contrary to claim 13, which specifically recites that registering holes are defined at the ends of adjacent compression and tension webs for receiving a bolt. According to Applicant's claim 13, the tension and compression webs are directly connected together and to the chords and, thus, not solely via

the chords as taught by McClain. By commonly attaching tension and compression webs to the chords, as recited in claim 13, it becomes possible to center respective neutral axes of the webs and the chords such that they almost perfectly intersect in a single point (theoretical node of the truss). This advantageously practically eliminates end member moments at the connection that in the case of thin-plate-cold-form structural elements considerably contributes to the reduction of their buckling strength. The entire sentence in column 3, line 53 to 55 of United States Patent No. 4,621,475 *"This feature facilitates the positioning of adjacent struts substantially contiguous one another and securement thereto by welding, or the like,* " relates to the connections shown in Fig. 6 and Fig. 7 where the appropriate tapering to the diagonals is required in order to accommodate the intersection of the neutral axis. Therefore, if the author arranges the struts *"contiguous one another"* the position of the neutral axis is possible only by welding and it is not *"obvious to one having ordinary skill in the art that the webs of McCLAIN could be bolted to the vertical leg of the chord.*

In view of the above remarks, this application is now believed to be in condition for allowance and, accordingly, a notice to this effect is earnestly solicited.

Respectfully submitted,

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By:

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Date

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